**Explanation Framework**

**Learning Sequence for Teaching & Practicing Scientific Explanations**

1. Make the framework explicit.

2. Model and critique explanations.

3. Provide a rationale for creating explanations.

4. Connect to everyday explanations.

5. Assess and provide feedback to students.

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**Rubric for Learning the Cl-Ev-R Scientific Explanation**

Claim

1. **Relevant** 🡪 The claim directly & clearly responds to the question.
2. **Stands-Alone** 🡪 The claim statement is complete (stands alone).



Evidence

1. **Appropriate** 🡪 Is this the right type of evidence for this claim?

(Discuss this in the “Reasoning” section.)

* 1. Validity: Measurements & observations are relevant.
  2. Validity: Controlled variables focus attention on key factors.

1. **Sufficient** 🡪 Is there enough evidence?
   1. Reliability: Repeated trials will increase confidence.
   2. Full Range: Enough different conditions/values of variables?
   3. Full Range: The explanation cites enough examples to represent the whole data set without being tedious.

Reasoning

1. **Stands-Out** 🡪 Is the reasoning obvious, or hard-to-spot?
   1. DO NOT repeat the Claim or the Question.
   2. DO NOT repeat the Evidence.
2. **Link** 🡪 Why this data should count as evidence.
   1. Why it’s the right type of measurement/observation.
   2. How the controls help to validate the link.
3. **Science Concept** 🡪 Use scientific concepts to connect reasoning to claim:
   1. Is this the right science concept to connect the reasoning to the claim?
   2. Is the science concept clear and correctly used?

Note: A fuller scientific explanation will also contain a “Rebuttal,” which describes alternative Claims, plus the Evidence and/or Reasoning that refute the alternative Claim.

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| **Feedback Rubric for Scientific Explanations** | | | | |
|  | 4 | 3 | 2 | 1 |
| **Claim** | | | | |
| **Relevant** 🡪 The claim directly & clearly responds to the question. | Claim directly & clearly responds to the question. | Claim responds directly or clearly to the question. | Claim does not respond to the question. | No claim statement. |
| **Stands-Alone** 🡪 The claim statement is complete | Claim stands alone as a complete statement. | Minor missing piece to be a complete statement. | Vague or missing pieces. |
| **Evidence** | | | | |
| **Appropriate** 🡪 Is this the right type of evidence for this claim? | Data is relevant to the question.  Controls focus on key variables. | Data is relevant, but there are not enough controlled variables. | Cites evidence that is not relevant to claim. | No evidence cited. |
| **Sufficient** 🡪 Is there enough evidence? | Full range of data is cited, and that data has several conditions and repeated trials. | Cites unbalanced parts of the data, or data that is not from repeated trials. | Cites a minimal amount of data. |
| **Reasoning** | | | | |
| **Stands-Out** 🡪 Is the reasoning obvious, or hard-to-spot? | Reasoning statements stand out among other statements. | Reasoning is present, but is not obvious. | Repeats the Claim, Question, or Evidence. | No reasoning statements. |
| **Link** 🡪 Why this data should count as evidence. | Says how the data are the right data, and/or how the controls validate the data. | Minor piece is missing. | Attempts, but is unclear about how the data cited is relevant. |
| **Science Concept** 🡪 Use scientific concept to connect reasoning to claim | Includes appropriate and sufficient science concepts to explain why the evidence supports the claim. | Includes some appropriate science concepts for why the evidence supports the claim, but not sufficiently | Lightly addresses the science concepts, may fail to connect to claim or evidence, and/or may have some incomplete science concepts. |

**Three Parts of Feedback:**

1. Specifically describe what was done well (see rubric).
2. Clarify the target: evidence-based explanation with CLAIM + EVIDENCE + REASONING.
3. Specifically describe what must be done next to improve the explanation (see rubric).

**Notes:**

* Look at all parts to judge the strength and truth of the explanation. The truth of the Claim statement should not be judged by itself.
* Look elsewhere to judge the accuracy of the data.
* Pieces of reasoning sometimes get embedded in the Claim statement.